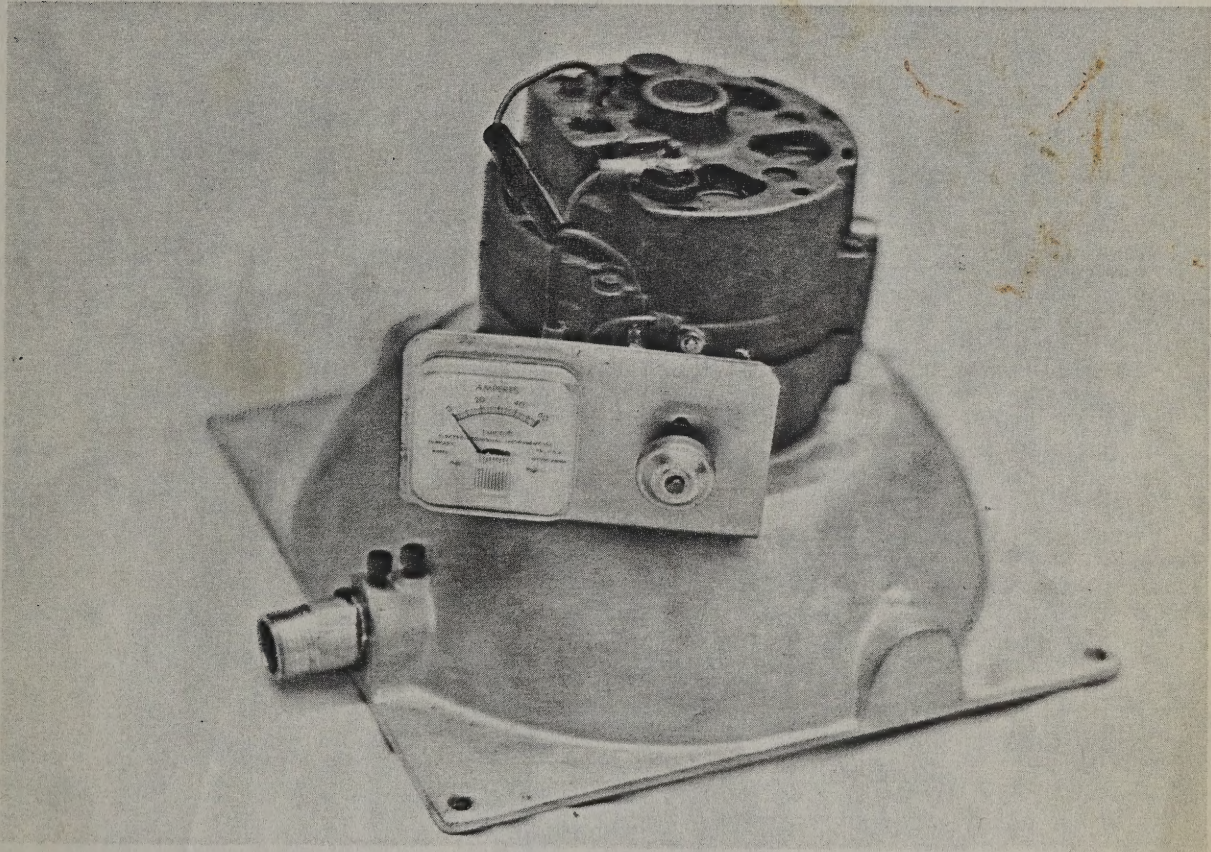
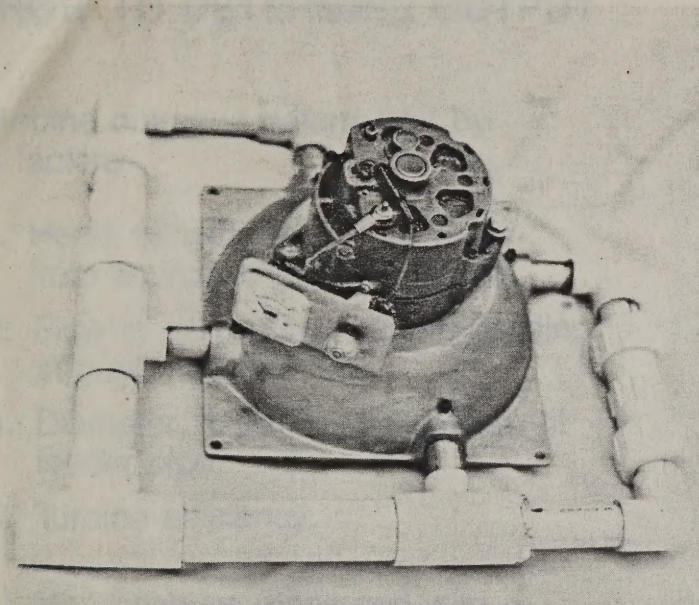


HARRIS HYDROELECTRIC SYSTEMS



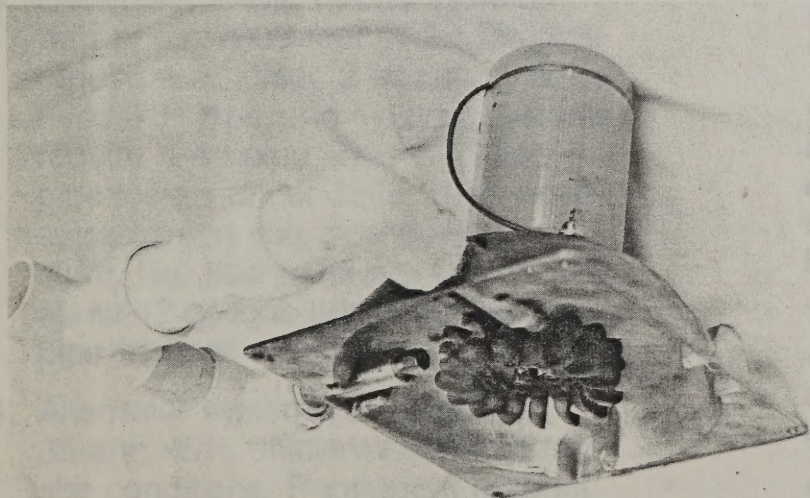
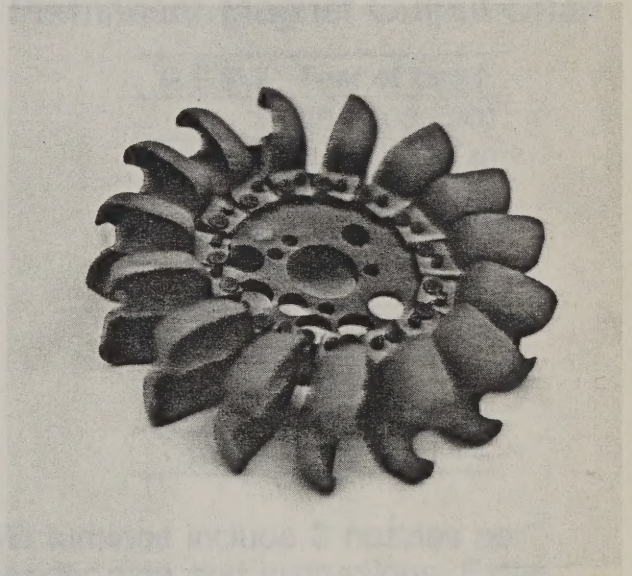
A LINE OF VERTICAL AXIS 12-VOLT DC PELTON GENERATOR SYSTEMS

- OPERATES EFFICIENTLY ON 40 TO 600 FEET OF HEAD
- OPERATES EFFICIENTLY ON 2 TO 120 GALLONS/MIN. FLOW.
- AVAILABLE WITH SITE SELECTED DELCO ALTERNATOR
- AVAILABLE WITH EFFICIENT PERMANENT MAGNET GENERATOR
- AVAILABLE AT OTHER VOLTAGES AND OUTPUTS BY REQUEST



4 nozzle Delco equipped turbine. Multiple nozzle arrangement allows much more water to impact the runner resulting in greater output at any head and usable power at a much lower head. Delco equipped turbines include an amp gauge and an output optimizing circuit allowing maximum efficiency at any combination of head and flow.

The Pelton type runner is made of hard anodized, heat treated aluminum alloy. The wheel is 80 to 90% efficient depending on nozzle size and head. The bucket shape allows high efficiency for nozzles from .10" to over .40". This, combined with the use of 1 to 4 nozzles provides a flow range of over 70 to 1. The wheel has a hydraulic diameter of just over 4.00". Each wheel is individually balanced.



Underside view of 2 nozzle permanent magnet generator equipped system. The P.M. generator is more efficient than Delco in systems with from 75 to 200 feet of head. All turbines come with a variety of different size nozzles.

HOW TO DETERMINE OUTPUT

Turbine output is determined by 4 factors:

1. Head, or vertical drop of water from source to turbine nozzle.
2. Flow in gallons per minute passing through nozzle.
3. Diameter, length and condition of feeder pipe.
4. Turbine efficiency.

1. Head can be measured with a transit or level and a measuring stick of known length in successive steps — or — a quick pipe can be assembled from numerous garden hoses and the pressure measured with the hoses full of water. This, too, can be done in successive steps.
 $.43 \text{ P.S.I.} = 1 \text{ foot of head}$
 $2.3 \text{ feet} = 1 \text{ P.S.I.}$

2. A temporary dam can be built to measure flow by timing the filling of a container of known volume. Care should be taken not to dry up creeks but to leave enough water to maintain natural environmental balances.

3. Generally, single nozzle systems with under 2000 feet of feeder pipe require a 2" pipe; 2 nozzle systems need a 3" pipe, and 4 nozzle systems require a 4" pipe. This will keep pipe losses under 25%. High head systems can use pipe down to 1" diam. But flow rates are limited to about 12 gallons per minute and pipe frictions are high.

4. Alternator systems are between 35 and 45% efficient depending on site conditions. Permanent magnet system efficiency is between 40 and 60%.

Delco Alternator Output Chart (Pipe losses not included)

G.P.M.	Feet of head					
	50	75	100	200	300	600
2	—	—	—	20	50	100
5	—	—	25	70	120	250
10	—	30	70	150	240	500
15	—	50	100	210	375	—
20	40	80	150	320	500	—
30	70	120	220	500	—	—
50	100	200	350	—	—	—
100	200	400	500	—	—	—

Output figures in watts

Permanent Magnet Output Chart

G.P.M.	Feet of head		
	75	100	200
2	—	—	40
5	—	35	100
10	40	85	200
15	60	125	300
20	85	175	400
30	150	300	500
50	225	500	—
100	450	—	—

All turbines include 3 nozzles per feeder pipe and instructions. Extra nozzles are available for \$1.50 each and exist in increments of $\frac{1}{32}$ " from $\frac{1}{8}$ to $\frac{7}{16}$ ".

All system hardware except electronics is guaranteed for 1 year for everything except abuse and silt erosion. All electronics are guaranteed for 3 months, but must be properly installed.

The rebuilt Delco systems are versatile, virtually maintenance free, and generators are universally available.

The Permanent Magnet systems are substantially more efficient from 100 to 150 feet of head, but require periodic brush replacement.

HOW TO DETERMINE OUTPUT

Machine output is determined by

Head or vertical drop of water from source to turbine nozzle
Flow in gallons per minute passing through nozzle
Diameter, length and condition of leader pipe
Turbine efficiency

Head can be measured with a transit or level and a measuring stick of known length in successive steps — or — a quick pipe can be assembled from numerous garden hoses and the pressure measured with the hoses full of water. This too can be done in successive steps:
 $4.3 \text{ P.S.I.} = 1 \text{ foot of head}$
 $2.8 \text{ feet} = 1 \text{ P.S.I.}$

A temporary dam can be built to measure flow by timing the filling of a container of known volume. Care should be taken not to dry up creeks but to leave enough water to maintain natural environmental balances.

Generally, single nozzle systems with under 2000 feet of leader pipe require a 2" pipe. 2 nozzle systems need a 3" pipe, and 4 nozzle systems require a 4" pipe. This will keep pipe losses under 25%. High head systems can use pipe down to 1" and flow rates are limited to about 12 gallons per minute and pipe friction is high.

Atomizer systems are between 25 and 45% efficient depending on site conditions. Permanent magnet system efficiency is between 40 and 60%.

DETAILED OUTPUT CHART

(Pipe losses are included)

G.P.M.		Feet of head			
50	25	200	250	300	400
5	—	—	—	—	—
5	—	—	—	—	—
10	—	—	—	—	—
15	—	—	—	—	—
20	—	—	—	—	—
30	—	—	—	—	—
40	—	—	—	—	—
50	—	—	—	—	—
60	—	—	—	—	—
70	—	—	—	—	—
80	—	—	—	—	—
100	—	—	—	—	—
120	—	—	—	—	—

Output in gallons per minute

Permanent Magnet Output Chart

G.P.M.		Feet of head	
75	100	200	300
5	—	—	—
5	—	—	—
10	—	—	—
15	—	—	—
20	—	—	—
30	—	—	—
40	—	—	—
50	—	—	—
60	—	—	—
70	—	—	—
80	—	—	—
100	—	—	—
120	—	—	—

All turbines require 2 nozzles per leader pipe and instructions E-10. Nozzles are available for 2.5, 3 and 4 inch diameters of pipe. They are 1/2 inch thick.

All system hardware except electronics is guaranteed for 1 year for everything except abuse and all erosion. All electronic parts are guaranteed for 2 months but must be properly installed.

The typical Deico system is virtually maintenance free and needs about the universal available.

The Permanent Magnet system is an optional, a more efficient system to 150 feet of head and requires periodic brush cleaning.

PRICE LIST

	Delco	P.M. Generator
Single nozzle	\$495	\$545
2 nozzle	\$575	\$625
4 nozzle	\$695	\$745
Special voltage & output systems cost upon request		

Site Evaluation

Please send the following information to assist in selecting the best system for your site.

1. Head or Drop in elevation from source to turbine site.
2. Flow in gallons per minute to be used.
3. Length, size and condition of pipe to be used: perhaps a simple sketch.

Ordering Information

Send cash, money order, check or bank card information to:

Harris Hydroelectric
632 Swanton Rd.
Davenport, California 95017

If you use a bank card, please indicate number, type of card, expiration date, and be sure to sign the form.

Name — Shipping Address —
Telephone number

Allow 2 to 4 weeks delivery time.

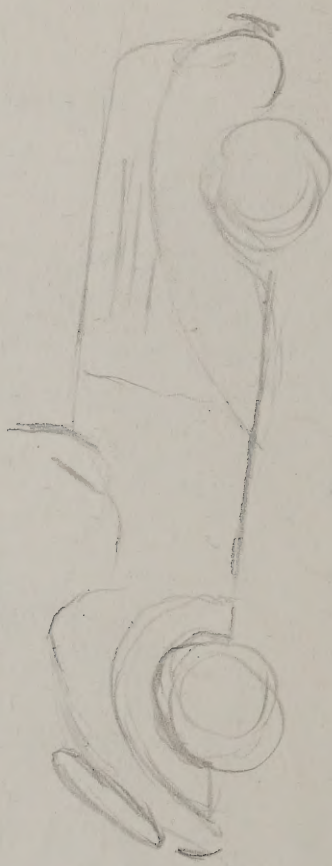
Thank
You
For
Your
Interest

PRICE LIST

Model	Price	Options
Model A	\$245	Standard
Model B	\$255	Standard
Model C	\$265	Standard
Model D	\$275	Standard
Model E	\$285	Standard

62234
82234
92234

Thank You For Your Interest



Site Evaluation

When evaluating the following information, please select the best system for your site.

Method of Dig in elevation from ground to surface site.

Flow in gallons per minute to be used.

Depth, size and condition of pipe in use. Perhaps a simple sketch.

Ordering Information

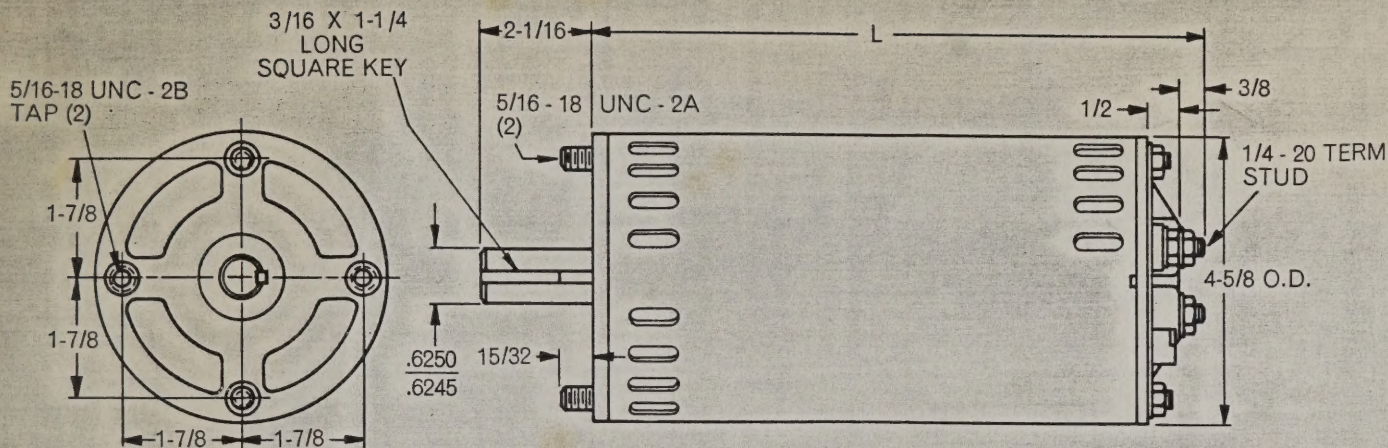
Send cash, money order, check or bank card information to:

Hand Hydrolics
6325 S. Main Rd.
Dayton, California 95017

If you use a bank card, please indicate number, type of card, expiration date, and the date to sign the form.

Name — Shipping Address —
Telephone number

Allow 2 to 4 weeks delivery time.



COMMON MOTOR SIZES

Part No.	Volts	HP	RPM	Amps	Lb-In	Encl	Length Inches	Duty	Weight Lbs.
BA3620-301-1	12	1/8	900	10	9	TENV	7-11/16	Cont	14.0
BA3608-302	12	1/8	1800	11	4.5	TENV	6-1/4	Cont	9.0
BA3628-665	12	1/4	900	21	18	TENV	8-11/16	Cont	17.0
BA3618-303-1	12	1/4	1200	21	13	TENV	7-3/4	Cont	14.0
BA3614-304-1	12	1/4	1800	22	9	TENV	6-15/16	Cont	11.5
BA3620-305	12	1/3	1800	28	12	TENV	7-11/16	Cont	14.0
BA3614-306	12	1/3	3600	29	6	TENV	6-15/16	2 Hr	11.5
BA3630-482	12	1/2	1800	41	18	TENV	9	Cont	18.0
BA3624-307-1	12	1/2	2400	42	13	TENV	8-1/4	2 Hr	15.5
BA3616-585	12	1/2	3600	38	9	TENV	7-1/4	1/2 Hr	12.5
BA3618-1175	12	.7	3000	58	15	TENV	8-1/2	1/2 Hr	16.5
BA3620-308	12	3/4	3400	57	13	TENV	8-1/4	1 Hr	15.5
BA3628-1176	24	1/4	900	10	18	TENV	8-11/16	Cont	17.0
BA3620-309	24	1/4	1200	10	13	TENV	7-3/4	Cont	14.0
BA3618-310-1	24	1/4	1800	10	9	TENV	7-3/4	Cont	14.0
BA3614-311-1	24	1/4	3600	11	4.5	TENV	6-15/16	Cont	11.5
BA3629-1177	24	1/2	1200	19	26	TENV	8-7/8	Cont	17.5
BA3628-312-1	24	1/2	1800	20	18	TENV	9	Cont	18.0
BA3624-313	24	1/2	2400	21	13	TENV	8-1/4	2 Hr	15.5

Part No.	Volts	HP	RPM	Amps	Lb-In	Encl	Length Inches	Duty	Weight Lbs.
BA3620-314-1	24	1/2	3600	22	9	TENV	7-11/16	2 Hr	14.0
BA3640-827	24	3/4	1200	28	39	TENV	10-1/4	Cont	21.0
BA3637-315-1	24	3/4	1800	29	26	TENV	10-1/4	Cont	21.0
BA3637-316-1	24	3/4	2400	29	20	TENV	10-1/4	Cont	21.0
BA3624-317	24	3/4	3600	29	13	TENV	8-1/4	1 Hr	15.5
BA3634-1178	24	1	1800	37	32	Open	10	Cont	20.5
BA3634-1179	24	1	3400	38	19	Open	10	Cont	20.5
BA3644-1180	24	1-1/4	2600	45	30	Open	11-1/4	2 Hr	23.5
BA3616-556	36	1/4	1800	6.5	9	TENV	7-1/2	Cont	13.0
BA3620-688	36	1/3	1800	8.5	12	TENV	7-11/16	Cont	14.0
BA3616-1181	36	5/8	3200	16	12	TENV	6-3/4	2 Hr	11.0
BA3616-1182	36	1/2	3800	14	8	TENV	6-3/4	2 Hr	11.0
BA3637-318-1	36	3/4	1800	19	26	TENV	10-1/4	Cont	21.0
BA3640-319-1	36	1	2400	26	26	TENV	11-1/4	Cont	23.5
BA3621-1183	36	1	3000	28	21	Open	8-3/8	2 Hr	13.0
BA3632-1184	36	1	2900	25	18	Open	9-3/4	Cont	20.0
BA3640-1185	36	1-1/4	3400	32	23	Open	10-3/4	Cont	22.5
BA3644-320-1	36	1-1/2	3000	35	32	TENV	10-3/4	1-1/2 Hr	22.5
BA3644-1186	36	1-1/2	3300	35	29	Open	11-1/4	2 Hr	23.5

Above motors designed for minimum operating temperature of -10°F and for non-plug reversing operation.

Plug-reversing operation or extreme low temperature operation can be furnished on request.

Special speeds, horsepowers, and voltages available on request.

Mounting Specifications—Add suffix to part number:

NEMA 48 base—48B NEMA 48 face—48C NEMA 48 base & face—48BC

NEMA 56 base—56B NEMA 56 face—56C NEMA 56 base & face—56BC

Stud Mount—48S Pump face & base—48BP

Unless otherwise specified 48B mounting will be furnished

Optional Features: STATE WHEN ORDERING: Thermostat Overload Protection • Current Overload Protection • Terminal Cover • Brush Inspection Plates • Centrifugal Switch • Precision Balance

Rear Shaft Extension • Plug Reversing • Low temperature Operation (-65°F) • Front Shaft Diameter to 7/8" • Explosion Proof

Write for bulletins on other models:

MODEL EP—Explosion proof.

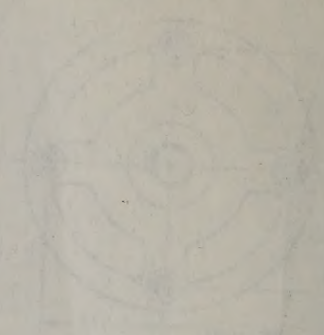
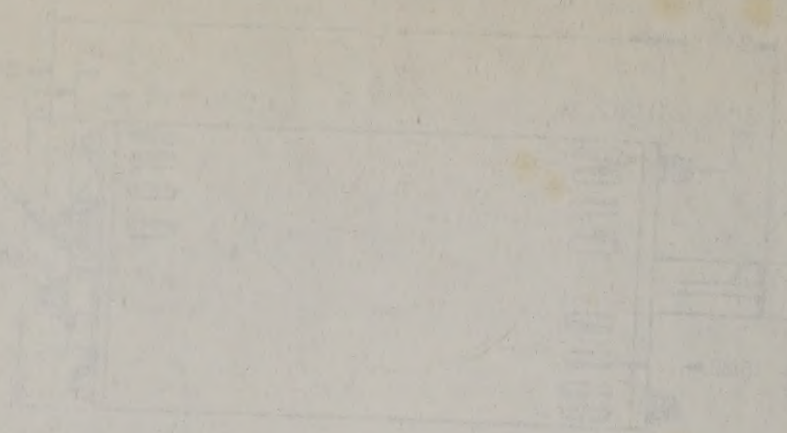
MODEL HT—High starting torque motor for AC.

MODEL SR—For SCR speed control service.

MODELS CN & DA—REDI-LINE motor generators.

Honeywell

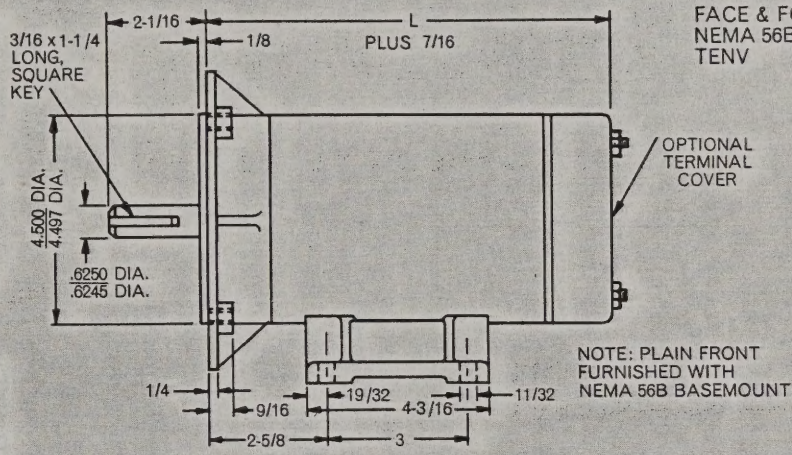
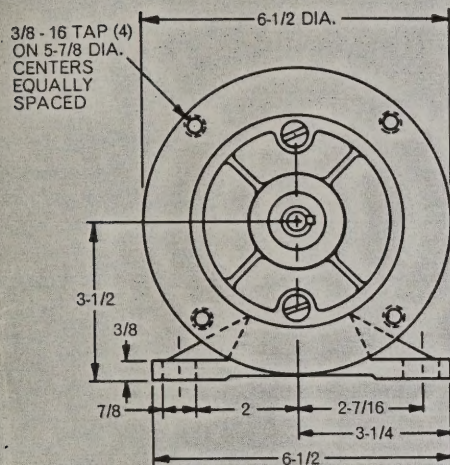
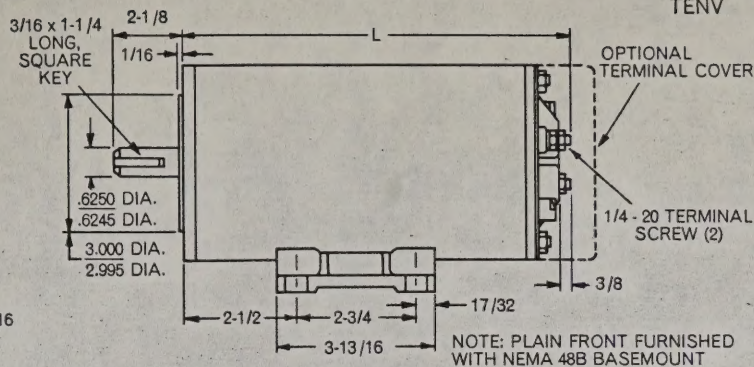
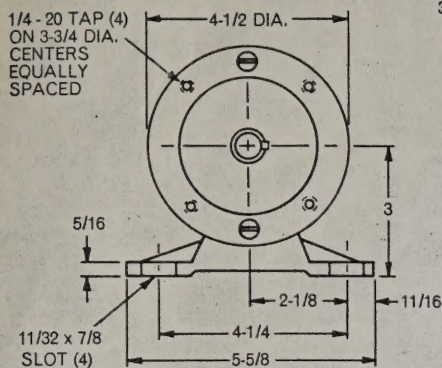
HONEYWELL MOTOR PRODUCTS P.O. Box 106, Rockford, IL 61105 Phone 815/966-3600, Telex 257-315



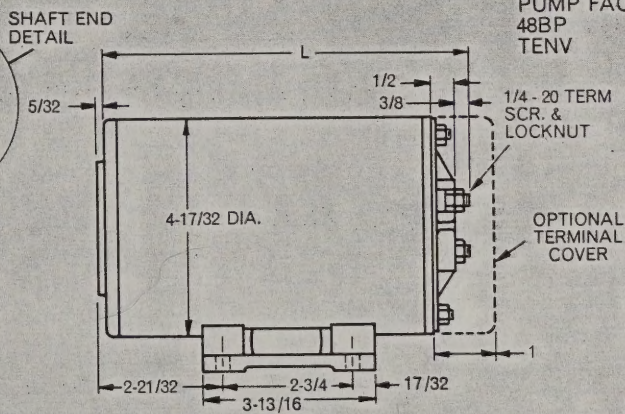
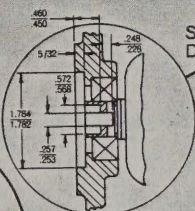
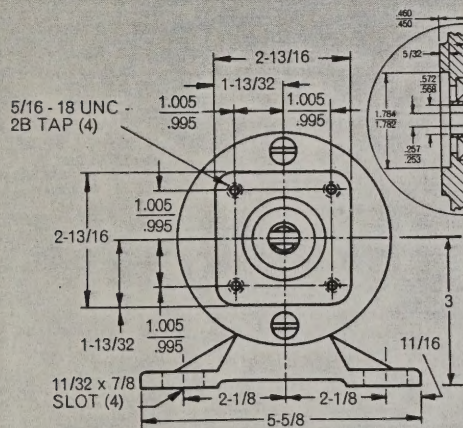
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Honeywell

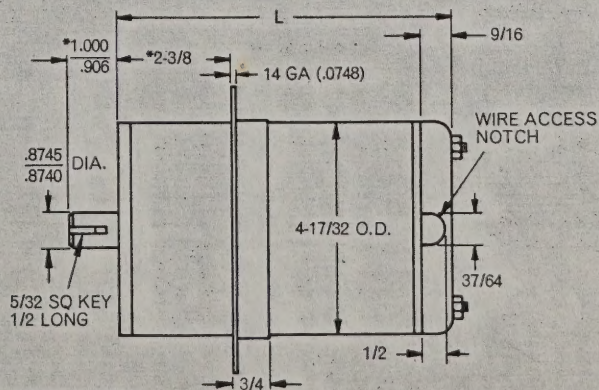
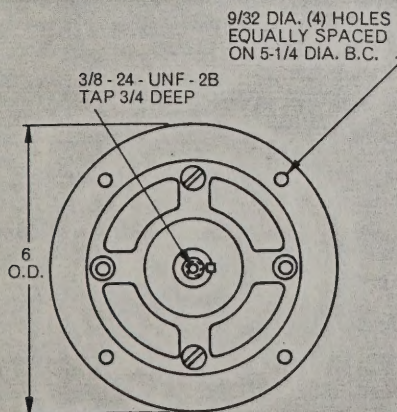
FACE & FOOT MOUNT
NEMA 48BC
TENV



FACE & FOOT MOUNT
NEMA 56BC
TENV



PUMP FACE & FOOT MOUNT
48BP
TENV



COLLAR MOUNT
TENV

*MAY BE VARIED TO SUIT

